a transverse fiber-ring optical resonator segment integral with the resonator optical fiber and formed by cylindrical processing of the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

18. A fiber-ring optical resonator, comprising:

a silica-based resonator optical fiber; and

a silica-based transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

19. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

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a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a diameter sufficiently larger than the diameter of at least one immediately adjacent segment of the resonator fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

20. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber and formed by spatially-selectively removing material from the resonator fiber, the resonator segment thereby having a diameter sufficiently larger than the diameter of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

21. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

a transverse fiber-ring optical resonator segment formed by spatially-selectively depositing optical material onto the resonator fiber, the resonator segment thereby having a diameter sufficiently larger than the diameter of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

22. A fiber-ring optical resonator, comprising:

a silica-based resonator optical fiber; and

a transverse fiber-ring optical resonator segment formed by spatially-selectively depositing silica-based optical material onto the resonator fiber, the resonator segment thereby having a diameter sufficiently larger than the diameter of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

23. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

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a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a refractive index sufficiently larger than a refractive index of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

24. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber and formed by spatially-selective densification of the resonator optical fiber, the resonator segment thereby having a refractive index sufficiently larger than a refractive index of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

25. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber and formed by spatially-selective UV-irradiation of the resonator optical fiber, the resonator segment thereby having a refractive index sufficiently larger than a refractive index of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

26. A fiber-ring optical resonator, comprising:

a resonator optical fiber; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber and formed by spatially-selectively doping of the resonator optical fiber, the resonator segment thereby having a refractive index sufficiently larger than a refractive index of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

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27. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a delocalized-optical-mode suppressor provided on the resonator optical fiber.

28. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to

support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a scattering element provided on at least a portion of at least one of the first and second segments of the resonator fiber for suppressing delocalized optical modes.

29. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a coating provided on at least a portion of at least one of the first and second segments of the resonator fiber for suppressing delocalized optical modes.

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30. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a hermetic carbon coating provided on at least a portion of at least one of the first and second segments of the resonator fiber for suppressing delocalized optical modes.

31. A fiber-ring optical resonator, comprising:

a hollow-core resonator optical fiber; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent

segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment,

the hollow core of the resonator fiber serving as a delocalized-optical-mode suppressor.

32. A fiber-ring optical resonator, comprising:

a resonator optical fiber having an optically lossy core; and

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment,

the optically lossy core of the resonator fiber serving as a delocalized-optical-mode suppressor.

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33. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a taper-positioning-and-support structure provided on the resonator fiber and adapted for engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment, thereby enabling evanescent optical coupling of the fiber-ring optical resonator and the transmission fiber-optic waveguide.

34. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent

segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a taper-positioning-and-support structure provided on the resonator fiber and adapted for engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment and axially displaced from an axial midpoint of the resonator segment, thereby enabling evanescent optical coupling of the transmission fiber-optic waveguide and the fiber-ring optical resonator and reducing undesirable fiber-optic-taper-induced optical loss of the fiber-ring optical resonator.

35. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a diameter sufficiently larger than the diameter of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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a radially-extending radially-tapered transverse flange positioned on the adjacent segment of the resonator fiber near an edge of the resonator segment and adapted so that a fiber-optic-taper segment of a transmission fiber-optic waveguide may rest on the flange and the edge of the fiber ring thereby enabling evanescent optical coupling of the transmission fiber-optic waveguide and the fiber-ring optical resonator and reducing undesirable fiber-optic-taper-induced optical loss of the fiber-ring optical resonator.

36. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a taper-positioning-and-support structure provided on the resonator fiber and adapted for engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment and radially displaced from an outer circumference of the resonator segment, thereby enabling evanescent optical coupling of the transmission fiber-optic waveguide and the fiber-ring optical resonator and reducing undesirable fiber-optic-taper-induced optical loss of the fiber-ring optical resonator.

37. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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paired axially-juxtaposed radially-extending radially-tapered transverse flanges positioned on an outer circumference of the resonator segment and adapted so that a fiber-optic-taper segment of a transmission fiber-optic waveguide may rest on the paired flanges, thereby enabling evanescent optical coupling of the transmission fiber-optic waveguide and the fiber-ring optical resonator and reducing undesirable fiber-optic-taper-induced optical loss of the fiber-ring optical resonator.

38. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a taper-positioning-and-support structure provided on the resonator fiber and adapted for

engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment, thereby enabling evanescent optical coupling of the fiber-ring optical resonator and the transmission fiber-optic waveguide, and

enabling partially-wrapped engagement of the fiber-optic-taper segment around the fiber-ring optical resonator near a portion of the outer circumference thereof.

39. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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a taper-positioning-and-support structure provided on the resonator fiber and adapted for

engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment, thereby enabling evanescent optical coupling of the fiber-ring optical resonator and the transmission fiber-optic waveguide,

enabling partially-wrapped engagement of the fiber-optic-taper segment around the fiber-ring optical resonator near a portion of the outer circumference thereof, and

providing an elongated region of evanescent optical coupling between the fiber-ring optical resonator and the fiber-optic-taper segment.

40. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a taper-positioning-and-support structure provided on the resonator fiber and adapted for

engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment, thereby enabling evanescent optical coupling of the fiber-ring optical resonator and the transmission fiber-optic waveguide,

enabling partially-wrapped engagement of the fiber-optic-taper segment around the fiber-ring optical resonator near a portion of the outer circumference thereof, and

enabling length adjustment of a region of evanescent optical coupling between the fiber-ring optical resonator and the fiber-optic-taper segment.

41. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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a taper-positioning-and-support structure provided on the resonator fiber and adapted for

engaging a fiber-optic-taper segment of a transmission fiber-optic waveguide in proximity to the resonator segment, thereby enabling evanescent optical coupling of the fiber-ring optical resonator and the transmission fiber-optic waveguide,

enabling partially-wrapped engagement of the fiber-optic-taper segment around the fiber-ring optical resonator near a portion of the outer circumference thereof, and

stabilizing evanescent optical coupling between the fiber-ring optical resonator and the fiber-optic-taper segment.

42. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to

support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a radially-extending transverse flange provided on at least one of the first and second segments of the resonator fiber and adapted to be received in a corresponding groove of an alignment member.

43. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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a circumferential groove provided on at least one of the first and second segments of the resonator fiber and adapted for receiving a corresponding flange of an alignment member.

44. A fiber-ring optical resonator, comprising:

a resonator optical fiber;

a transverse fiber-ring optical resonator segment integral with the resonator optical fiber between first and second segments of the resonator fiber, the resonator segment having a circumferential optical path length sufficiently different from the circumferential optical path length of an immediately adjacent portion of at least one of the first and second segments of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

a modulator provided on the resonator optical fiber for modulating optical loss of the fiber-ring optical resonator.

45. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system.

46. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

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the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system,

a spectral width of a resonance band of the coupled-optical-resonator system being smaller than an optical channel spacing of an optical WDM system.

47. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system,

a spectral width of a resonance band of the coupled-optical-resonator system being substantially equal to an optical channel spacing of an optical WDM system.

48. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

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the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system,

a spacing between spectrally-adjacent resonance bands of the coupled-optical-resonator system being greater than an optical channel spacing of ~~the~~ an optical WDM system.

49. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system,

spectrally-adjacent resonance bands of the coupled-optical-resonator system being spaced by about an integer times an optical channel spacing of ~~the~~ an optical WDM system.

50. A coupled fiber-ring optical resonator assembly, comprising:

a resonator optical fiber; and

multiple transverse fiber-ring optical resonator segments integral with the resonator optical fiber,

the resonator segments each having a circumferential optical path length sufficiently different from the circumferential optical path length of at least one corresponding immediately adjacent segment of the resonator optical fiber so as to enable each resonator segment to support at least one resonant optical mode near an outer circumferential surface of the respective resonator segment,

the multiple resonator segments being sufficiently closely spaced so as to be evanescently optically coupled, thereby forming a coupled optical resonator system,

each of the plurality of resonator segments being resonant at a substantially common optical resonance frequency,

the multiple resonator segments being substantially uniformly longitudinally spaced on the resonator optical fiber.

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51. A method for altering transmission of an optical signal through a transmission optical waveguide, comprising the step of evanescently optically coupling a fiber-ring optical resonator to the transmission optical waveguide, thereby altering transmission of the optical signal through the transmission optical waveguide when the optical signal is substantially resonant with at least one resonant optical mode, the resonant optical mode being at least partially supported by the fiber-ring optical resonator, the fiber-ring optical resonator comprising a transverse resonator segment integral with a resonator optical fiber and having a circumferential optical path length sufficiently different from a circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

52. A method for altering transmission of an optical signal through a transmission fiber-optic waveguide, comprising the step of evanescently optically coupling a fiber-ring optical resonator to the transmission fiber-optic waveguide at a fiber-optic taper segment thereof, thereby altering transmission of the optical signal through the transmission fiber-optic waveguide when the optical signal is substantially resonant with at least one resonant optical mode, the resonant optical mode being at least partially supported by the fiber-ring optical

resonator, the fiber-ring optical resonator comprising a transverse resonator segment integral with a resonator optical fiber and having a circumferential optical path length sufficiently different from a circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment.

53. A method for altering transmission of an optical signal through a transmission optical waveguide, comprising the steps of:

evanescently optically coupling a fiber-ring optical resonator to the transmission optical waveguide, thereby enabling alteration of a level of transmission of the optical signal through the transmission optical waveguide when the optical signal is substantially resonant with at least one resonant optical mode, the resonant optical mode being at least partially supported by the fiber-ring optical resonator, the fiber-ring optical resonator comprising a transverse resonator segment integral with a resonator optical fiber and having a circumferential optical path length sufficiently different from a circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

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modulating a coupling condition between the transmission optical waveguide and the fiber-ring optical resonator, thereby modulating the level of transmission through the transmission optical waveguide of the optical signal between a higher operational transmission level and a lower operational transmission level when the optical signal is substantially resonant with at least one resonant optical mode.

54. A method for altering transmission of an optical signal through a first transmission optical waveguide, comprising the steps of:

evanescently optically coupling a fiber-ring optical resonator to the first transmission optical waveguide, thereby altering transmission of the optical signal through the first transmission optical waveguide when the optical signal is substantially resonant with at least one resonant optical mode, the resonant optical mode being at least partially supported by the fiber-ring optical resonator, the fiber-ring optical resonator comprising

a transverse resonator segment integral with a resonator optical fiber and having a circumferential optical path length sufficiently different from a circumferential optical path length of at least one immediately adjacent segment of the resonator optical fiber so as to enable the resonator segment to support at least one resonant optical mode near an outer circumferential surface of the resonator segment; and

optically coupling a second transmission optical waveguide to the fiber-ring optical resonator, thereby enabling transfer of the optical signal between the first transmission optical waveguide and the second transmission optical waveguide when the optical signal is substantially resonant with at least one resonant optical mode.

55. A method for altering an optical resonance frequency of a fiber-ring optical resonator, comprising the step of altering a diameter of the fiber-ring optical resonator until a desired optical resonance frequency is obtained.

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56. A method for altering an optical resonance frequency of a fiber-ring optical resonator, comprising the step of altering a refractive index of the fiber-ring optical resonator until a desired optical resonance frequency is obtained.

57. A method for altering an optical resonance frequency of a fiber-ring optical resonator, comprising the step of altering a width of the fiber-ring optical resonator until a desired optical resonance frequency is obtained.

58. A method for altering optical resonance spectral properties of a coupled fiber-ring optical resonator assembly, comprising the step of altering at least one of a number of coupled fiber-ring optical resonators, a degree of optical coupling among the fiber-ring optical resonators, and optical resonance spectral properties of each of the plurality of fiber-ring optical resonators.